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BIOTECHNOLOGIES

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[1]**Oleksandr I. Zaporozhets,** Prof.
[2]**Yaroslav I. Movchan,** Assoc. Prof.
[3]**Viktor N. Gavrylenko,** Ph.D.
[4]**Dmytro V. Gulevets,** Postgraduate

ENERGY EFFICIENCY OF UKRAINE

National Aviation University
[1]E-mail: zap@nau.edu.ua
[2]E-mail: iar.movchan@ukr.net
[3]E-mail: vgviktel@gmail.com
[4]E-mail: gulevets@gmail.com

Abstract. *Disparities in the production structure, moral and physical obsolescence and depreciation of fixed assets in economics, low-effective use fuel and energy resources (FER) and water demands excessive use of energy, requiring substantial imports of energy resources (over 50% of needs). The resulting dependence of the basic branches of economy of Ukraine, primarily fuel and energy complex, from the exporting countries of fuel resources and, consequently, increasing the threat to energy safety. Meanwhile, such situation is in contrudiction of the principles of sustainable developments, adopted on the Summit in Rio-de-Janeiro (1992). Ukraine needs the more active energy efficient policy.*

Keywords: energy conservation, energy efficiency, energy intensity of gross domestic product, energy safety state, fuel and energy resources, innovative development, structural changes ineconomy.

Introduction

At the current stage of Ukraine's socio-economic development, the Gross Domestic Product Energy Intensity (GDPEI) reduction factor is one of the key factors in ensuring the nation's energy independence and improving its energy safety level.

The predicted potential of energy efficiency as a result of the efficient FER consumption, according to the estimates and conclusions of the Energy Strategy of Ukraine until 2030, amounts to 51,3 %. This potential implementation can lead to a significant drop in the FER consumption and resolve the acute problem of foreign energy dependence. Therefore, the strategic importance of the problem of efficient energy resource use is not inferior to the problem of diversifying their supply sources because the low efficiency of FER consumption results in a high net cost of produced products, works (services), which is the cause of a low competitiveness level of the national economy. As a result of the low energy resource use in producing products, works (services), primarily by enterprises in the basic industries: electric power, coal, oil and gas, chemical, metallurgy, machine engineering sectors, the GDP volume growth has dropped and has had an impact on development of both the relevant branches and the national economic development in general.

Research in the field

Considerable attention should work on the subject [1-5] and other domestic and foreign scientists to some extent explored the development of energy conservation in our country and have the basic tedentsiyi and patterns.

Aim of this article will highlight the status and trends in the development of energy efficiency, which took place in the spheres of economy of Ukraine in 2009 as one of the main criteria of success in the strategic future of society.

Condition and trends in energy efficiency

The GDPEI dynamics has been falling for the last decade in Ukraine (as shown in fig. 1), except in 2009 when its increase was recorded. At the same time, it continues to be high and is 2,1 to 3,7 times higher than the GDPEI of the world's economically developed countries.

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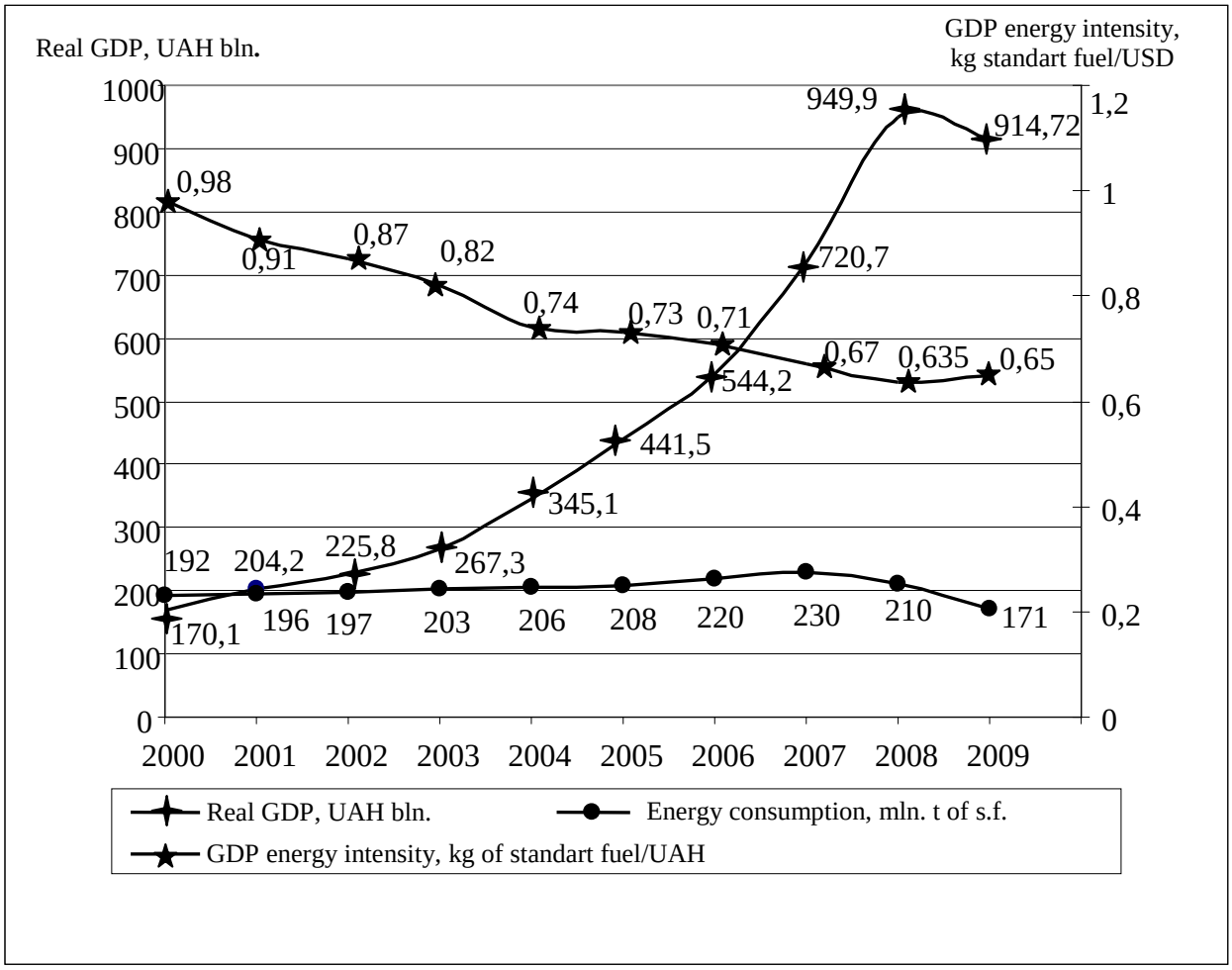

Fig. 1. Ukraine's GDPEI Dynamics during 2000-2009

A decline in the GDP energy intensity cannot be considered to be the result of the state policy in this field alone or the market factors of the energy consumption price flexibility. It was much more affected by the production scale factor, although a decline in the specific consumption of energy resources for manufacturing specific types of products, performing works, and providing services happen against the background of a marginal number of implemented energy efficiency projects, which initiated the process of upgrading the fixed assets of enterprises and introducing energy efficient technologies.

One of the factors distorting the real dynamics of the GDP energy intensity is the shadow economy (in particular in the 1990s when, according to different estimates, up to 60 % of the GDP "went" to the shadow economy). According to the Ministry of Economy, the shadow economy level in Ukraine in 2009 was approximately 34,9 %.

This situation has an impact on the GDPEI dynamics because energy resources are primarily consumed by companies enjoying a monopolistic position in the national market. Companies operating in the shadow sector earn huge revenues and are interested in no prudent use of FER.

Another problem of Ukraine's economy consists in it bearing a burden of social payments. During the transformation crisis, a sharp decline in the income and living standards of most Ukrainians provoked an extension of social safety guarantees and an increase in transfers of the preferential categories of citizens. This is why the share of social expenses in the total expenses of the government and the GDP was steadily increasing. This situation remains the same even today.

For this reason, the energy intensity of Ukraine's economy remains extremely high even if compared to some countries incorporated in the USSR (fig. 2).

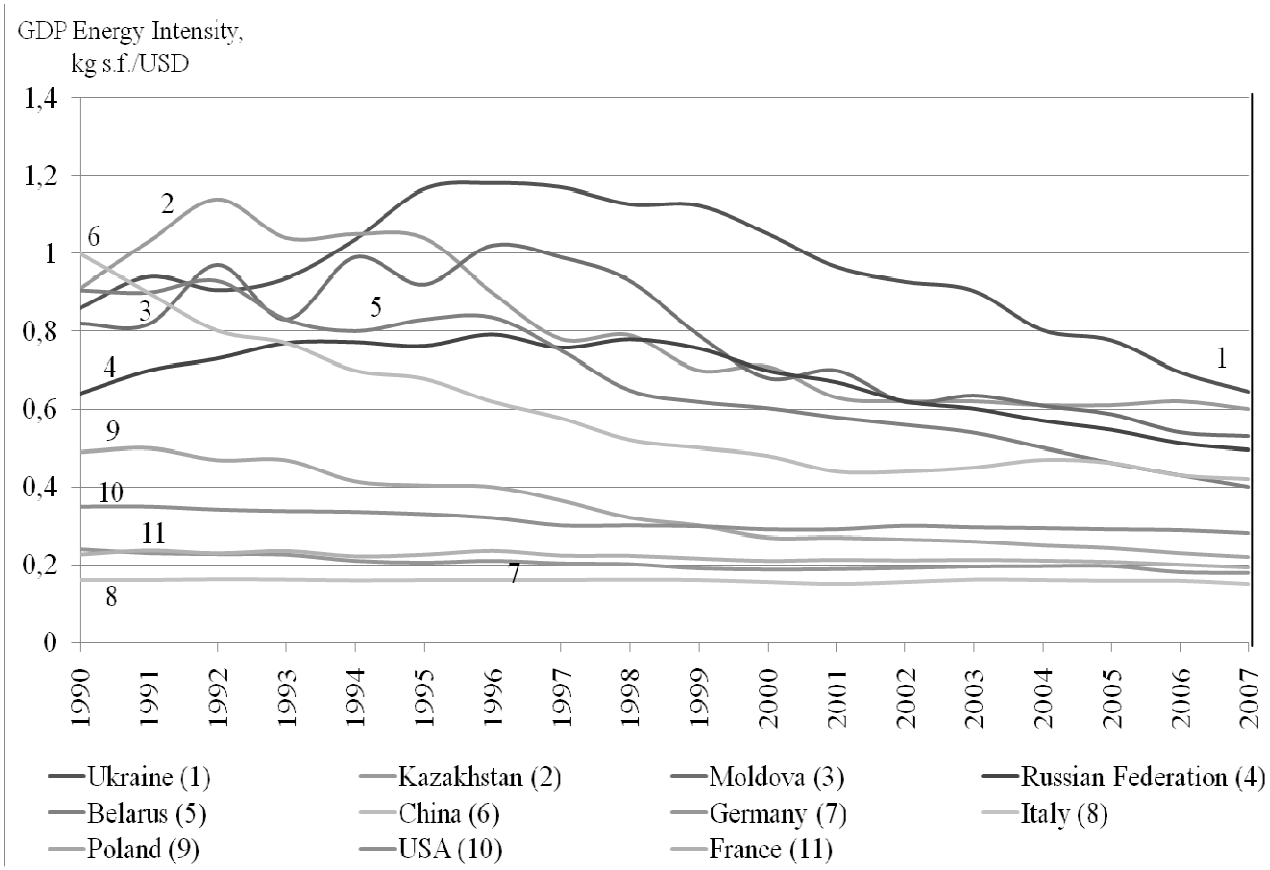

Fig. 2. GDPEI kg standart fuel/USD (according to the purchasing power parity in 2005) in 1990–2007

A few countries in the world only have higher GDPEI indicators than Ukraine, namely Turkmenistan (gas exporter), Uzbekistan (gas exporter), Mozambique and Togo.

Ukraine is a country partially supplied with its own energy resources and, therefore, has to import them. Just like the EU countries, Ukraine is half dependent in terms of energy on organic fuel supplies. The following developed European countries are energy dependent to the same or nearly the same extent as Ukraine: Germany: 61,4 %, France: 50 %, Austria: 64,7 %. Many countries of the world have much lower indicators of their own primary FER supplies, in particular, Japan uses them at the level of 7 %, Italy: about 18 %.

The level of Ukraine's energy dependence is average in Europe and tends to decrease, but it is characterized by a lack of diversification of the sources of supply of energy resources, primarily oil, natural gas, and nuclear fuel.

The structure of the primary energy consumption in Ukraine is predominated by natural gas: 35 % in 2009, while the specific weight of gas consumption in the world is 21 %; the oil consumption amount in Ukraine is 16,9 %, coal: 23,2 %, uranium: 15,2 %, water resources and other renewable sources: 9,7 %, (see table).

Structure of Primary Energy Consumption in Ukraine, EU Countries, USA, and the World in General, %

Primary Energy	World	Ukraine 2009	EU countries	USA
Natural gas	21	35,0	22	24
Oil	35	16,9	41	38
Coal	23	23,2	16	23
Uranium	7	15,2	15	8
Water resources and other renewable sources	14	9,7	6	7

Ukraine's system of energy supplies has been formed under the influence of the demand for energy resources of the country's economy and regions, the structure of the types of economic activities, available prospected supplies of energy resources, the state of the FES production infrastructure, terms of supply of scarce types of fuel, environmental limits, and the specific requirements to the level of the country's energy safety.

As a result of unprecedented growth of global prices for energy sources, it is necessary to improve largely the state policy of the efficient use of fuel and energy resources, taking into account experience of, first and foremost, the European Union members. In the environment of global competition for fuel and energy resources, the economy's energy efficiency and, accordingly, reduction of the cost of energy resources in manufacturing products, performing works, and providing services, is one of the few tools for Ukraine to gain competitive advantages in global markets and improve the wellbeing of its citizens.

Most FES enterprises have already exhausted their technological resource and need urgent replacement or upgrading of their fixed assets. According to the estimates of the Energy Strategy of Ukraine until 2030, the total amount of the necessary investments associated with the FES upgrading is higher than UAH 1 trillion (USD 200 billion) over the period of 2005-2030. This requires a higher level of investments in the country's economy as compared to what it has received for the last 18 years.

One of the causes of today's insufficient investment consists in the specifics of the FES ownership structure: most assets are owned by the state which finances the appropriate programs at a low level because the state budget is not sufficiently filled. Moreover, financing from the state budget is not always efficient as social and political interests prevail over economic interests. Investments by private enterprises flow in quite slowly.

Ukraine's economy is highly sensitive to instable global prices for fuel and energy resources.

The inefficient structure and high energy intensity of industrial production in Ukraine, constant fluctuations of the prices of energy resources encouraged enterprises to search for the alternative methods of improving the economic activity efficiency. Unwilling to search for reserves of the technological upgrading of production, enterprises in most sectors opted for an increase in prices and tariffs.

The export-oriented model of economic growth, which was implemented in Ukraine in the pre-crisis period, provided a relatively stable result due to a favourable situation in foreign markets. At the same time, it was accompanied by negative trends, in particular by those associated with the import growth rates in Ukraine, which started to overtake exports. Today, the national production industries supply only 2/3 of commodity resources of the country; other commodities are imported. However, if the country normally exports raw materials of low quality processing, it imports high-tech products of deep processing and end user products. This caused a steady increase in the import-export ratio in Ukraine. The growing trade balance deficit could be stabilized due to foreign borrowings, and, as a result, Ukraine's gross external debt, expressed as a percentage to the exported goods and services, is steadily growing.

Naturally, under these circumstances, the important deterioration of the trading environment in Ukraine as a result of a drop in the metal product prices in the second half of 2008, a decrease in the prices of the key export goods made by the agro-industrial sector during 2008-2009, and steadily growing gas prices had a negative impact on the country's economic situation.

Taking account of the current situation, these problems will be resolved during the general instability in the world, including in fuel and energy markets, accompanied by unfavourable forecasts for further growing prices of energy resources, etc [6].

The strategic directions of improving the energy efficiency and realizing the energy saving potential consist in the structural and technological restructure of the country's economy and in creating the administrative, regulatory, legal, and economic mechanisms helping improve energy efficiency and energy saving. The expenses per ton of standard fuel obtained as a result of taking energy efficiency measures are several times lower than the expenses associated with its extraction or purchase. For this reason, in the Ukrainian realities improvement of energy efficiency and energy saving becomes a strategic line of development of the economy and the social area in the short and long run. This is the way followed by the industrially developed countries, and the best success in improving efficiency was achieved by the most energy deficient of them (Japan, Italy, etc). The efficient use of energy resources is a determinant factor on which the efficient functioning of the national economy depends.

At present, the key factor of reduction in the energy intensity of products, works, and services in all the economic sectors is formation of the efficient system of state management in the energy efficiency area. This system will permit, first and foremost, to improve the structure of end consumption of energy resources, particularly, due to further extension and expansion of electrification in all the economic sectors by replacing the deficient types of fuel and improving the energy efficiency of production at the same time.

The economically reasonable potential of energy saving of Ukraine in 2030, in accordance with the Energy Strategy of Ukraine, is determined at 65 %, taking into account an impact of the technical and structural factors of energy saving on reduction in the amount of energy consumption by the national economic entities in respect to the amount of consumption of fuel and energy resources in 2000, i.e. by 2030 the GDP production amount is expected to grow by 2.7 times and consumption of primary energy resources by only 35,8 %.

The technical factor reflects an impact of the technical (technological) condition and level of equipment on the amount of consumption of energy resources in producing products (services).

The structural factor reflects an impact of the structural changes in the sectoral or intersectoral activities on the amount of fuel and energy consumption (fig. 3).

A basic prerequisite for the energy efficiency improvement consists in creating the legislative and regulatory basis, which could make it impossible to operate in the country the energy inefficient technologies, machinery, and equipment.

However, by developing this legal basis, it is necessary to take into account the existing condition of the country's economy and the high inertia of renewal of fixed assets. For this reason, its creation and implementation should develop in several stages. First and foremost, it is necessary to make it impossible to develop specific enterprises as a result of launching energy inefficient, obsolescent technologies and equipment, and sell to citizens household equipment consuming inefficiently energy resources. In the long run, it is necessary to create conditions under which it will be impossible to use obsolescent, energy wasting technologies, as it will result in economic sanctions and legally-based limits. An important factor of the energy efficiency improvement consists in providing the information and analytical support to all the economic entities. Implementation of the said measures has a priority importance, and the successful creation of the efficient system of government regulation in the area of energy efficiency will have a large impact on the possibility to make structural changes in the country's economy.

Conclusions

During the last decade in Ukraine lowering dynamics of EDGP is observed. However this tendency was not the result of entirely state politics in the sphere of energy efficiency or market factors of price elasticity demonstration. Range of activity factors and energy products price improvement had more significant impact on that. Major part of Ukrainian Fuel & Energy Complex has already exhausted its technological resource and needs immediate replacement or reequipment.

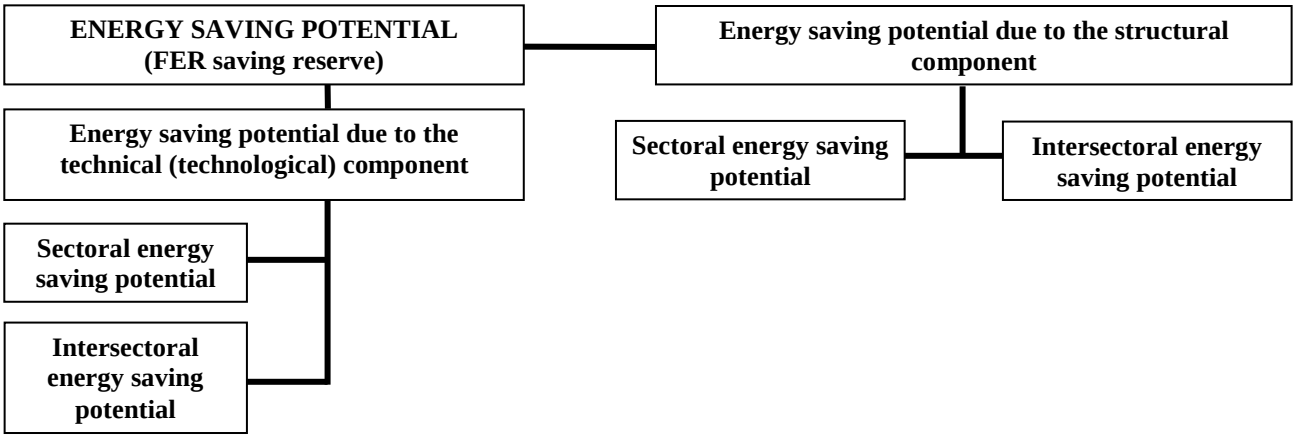

Fig. 3. Energy Saving Potential Structure

It's estimated by the Energy strategy of Ukraine till 2030 and in further perspective total amount of necessary investments into Fuel and Energy Complex overbalances 200 bln of USD in the period 2005-2030. This foresees higher investments level in comparison to that for the last 15 years.

Investments in energy efficiency as consumption during the same period can reach about 20 bln. of USD.

Low effectiveness and performance of national administration system and state policy realization, lack of appropriate legislative safetying of national administration mechanisms, inconsistency and actions in coordination of executive power bodies, insufficient effectiveness of Complex national program of energy saving of Ukraine cause absence of actual shift in energy efficiency improvement of economics. Under condition of growing competition for world EER, economics energy efficiency is practically the only instrument of competitive advantage receiving in the world stage and increase in material well-being, rise in the living standards of country's population due to reduction of EER expenditure for GDP creation. For Ukraine this issue has a special topicality taking into account the level of energy efficiency of its economics is 2-3 times worse than competitor-countries.

In this context also requires review and all the ideological platform of the Energy Strategy, which is based on further development Traditionally focused on energy and fuel and energy complex interests, laying the way minimal opportunities for innovation, whether technological or strategic oriented ecologically sustainable development.

Energy efficiency problems solving presupposes implementing of targeted actions that are oriented on energy state improvement in Ukraine and providing of human values - planet preserving for the next generations through environment destruction minimizing. Environmental assets such as oil, natural gas and solid fuel types are main sources of carbon dioxide excreting that plays important role in energy and biogeochemical biosphere balances, ecological and economic rationalization of their use is critical for the world economies.

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